RESEARCH TOPICS IN OPERATIONS MANEGEMENT

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MRP nervousness relative to inventory and scheduling policies

System nervousness in MRP (Material Requirement Planning) and MPS (Master Production Scheduling) systems result due to variability (frequency and size) of forecast versus actual values of the high level input parameters as forecasts are consumed. The inventory and scheduling policies could have mitigating or aggravating effects on the extent of the nervousness experienced due to these input variability. Opportunity exists to use some models to examine the combined effects of the input variable values and choice of system policy decisions on the system performance measures in various production scenarios.

TOC factors in an experimental design

TOC (Theory of Constraints) uses the DBR (Drum-Buffer-Rope) technique to schedule jobs and manage inventory in a constrained environment. At the heart of the DBR technique is the level of inventory maintained as this influences job scheduling, average inventory level and many other system performance parameters. There is no common rule about making the buffer inventory size decision, and this presents an opportunity for investigation. The focus here would be to identify the various factors that could affect and be affected by this buffer policy and how they, together, affect the system performance parameters in various production network typologies, especially looking at it from the VATIX (accepted term for logical/physical shape of production flow systems, V, A, T, I or X) angle.

Lean and VSM

The first fundamental activity of flow kaizen management in lean is Value Stream Mapping, and the main focus in VSM (Value Stream Mapping) is time compression for high velocity and inventory reduction. Little has been done to investigate some more aggregate measure for VSM, and it presents a good area for investigation. The opportunity here would be to research some more aggregate measures to consider when conducting VSM for lean and compare their implications on what decisions would be made as opposed to considering product velocity and inventory level only.

Lean and pitch design

The pitch of a lean production system is one of the important parameters of choice in lean implementation. It is the main factor that can indicate if all the sub systems of a global lean

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environment can operate to the rhythm of the pace maker. There is hardly any algorithm known for making this decision, and it presents an opportunity for investigation. Here, the goal is to develop some algorithm/heuristics to guide the lean practitioner to decide how to choose the appropriate pitch for their lean manufacturing system.

Joint replenishment models/heuristics

Replenishment of stock is an important area that has been well researched in the field of Operations Research. The EOQ (Economic Order Quantity) is a particular workhorse that has been modified in many different scenarios to make it fit many typical production systems. One such modification is the joint replenishment of stocks, and this area has even assumed some more important dimension as a result of supply chain collaboration. This area of replenishment is also important because inbound and outbound items of a production/supply chain system hardly map one-to-one to suppliers. Even in typical classic models developed, there are still opportunities for extensions using various tools of OR (mathematical modelling, mathematical programming, simulation, network models and even heuristics). While work has been done in this area, there are still opportunities in diverse areas.

Master scheduling with stochastic inputs

One of the assumptions that make most practitioners to doubt the applicability of master scheduling, especially within the purview of aggregate planning, is the assumption of determinism of inputs. One solution being explored other than inventory holding and replenishment cum scheduling policies is the stochastic scheduling at the master level and mathematical programming is one tool being considered. Opportunities exist to investigate this area using some more recent mathematical programming techniques with stochastic inputs.